

In the Claims:

1. (Currently Amended) A processor-readable medium comprising processor-executable instructions for mapping color data, the processor-executable instructions comprising instructions for:

adjusting a degree to which BG color coefficient generation is similar for process-neutral and K-only neutral images to produce BG coefficients;

adjusting a degree to which UCR color coefficient generation is similar for process-neutral and K-only neutral images to produce UCR coefficients; and

mapping CMY color data to CMYK color data using the produced BG coefficients and the produced UCR coefficients, wherein the mapping includes instructions for:

moving points in a process-neutral color space, thereby mapping the CMYK data to reduce color in neutral colors in process-neutral images, wherein moving points in a process-neutral color space includes instructions for:

mapping the process-neutral color space into a color space defined in Lab;

establishing a first vector between a point on a neutral axis and a point having a neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the color space defined in Lab;

establishing a third vector through the point having neutral hue and the point on the boundary of the color space defined in Lab;

1 establishing a fourth vector bisecting the second and the third
2 vectors;
3 projecting the point to be moved onto the fourth vector; and
4 using formulas based on lengths of the vectors to move the
5 point to be moved to a new location in the color space defined in Lab having
6 similar L value.

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8 **2. (Original)** The processor-readable medium as recited in claim 1,
9 wherein adjusting the degree to which BG color coefficient generation is similar
10 includes instructions for:

11 using similar BG coefficients for a color in both process-neutral and K-only
12 images, wherein the color is greater than a distance from a neutral line;

13 using dissimilar BG coefficients for a color in both process-neutral and K-
14 only images, wherein the color is less than the distance from the neutral line; and
15 controlling the distance.

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17 **3. (Original)** The processor-readable medium as recited in claim 2,
18 wherein controlling the distance includes instructions for:

19 setting the distance based on whether the process-neutral and K-only
20 neutral images will be printed side-by-side.
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1 **4. (Original)** The processor-readable medium as recited in claim 1,
2 wherein adjusting the degree to which UCR color coefficient generation is similar
3 includes instructions for:

4 using similar UCR coefficients for a color in both process-neutral and K-
5 only images, wherein the color is greater than a distance from a neutral line; and

6 using dissimilar UCR coefficients for a color in both process-neutral and K-
7 only images, wherein the color is less than the distance from the neutral line.

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9 **5. (Original)** The processor-readable medium as recited in claim 1,
10 wherein adjusting the degree to which UCR color coefficient generation is similar
11 includes instructions for:

12 assigning a greater value to UCR coefficients of a minor color; and

13 assigning a lesser value to UCR coefficients of more dominate colors.

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15 **6. (Cancelled)**

16 **7. (Cancelled)**

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18 **8. (Currently Amended)** The processor-readable medium as recited in
19 ~~claim 7~~ claim 1, wherein using formulas includes instructions for:

20 mapping values of a and b by adding $(dps/(db - \text{constant} * vml)) * vm(1)$
21 and $(dps/(db - \text{constant} * vml)) * vm(2)$ respectively; and

22 mapping values of a and b by adding values a and b to the vector vm where
23 the point to be moved is within a circle enclosing the first vector.

1 **9. (Currently Amended)** A method of controlling a degree to which a
2 process-neutral image and a K-only neutral image are harmonized, comprising:

3 generating similar BG values for colors within the process-neutral image
4 and the K-only neutral image beyond a first distance from a first neutral axis;

5 generating dissimilar BG values for colors within the process-neutral image
6 and the K-only neutral image within the first distance from the first neutral axis;

7 generating similar UCR values for colors within the process-neutral image
8 and the K-only neutral image beyond a second distance from a second neutral
9 axis;

10 generating dissimilar UCR values for colors within the process-neutral
11 image and the K-only neutral image within the second distance from the second
12 neutral axis; and

13 mapping CMY color data to CMYK color data using the generated BG
14 coefficients and the generated UCR coefficients, wherein the mapping includes:

15 adjusting the first and second distances to balance color similarity between
16 the process-neutral image and the K-only neutral image against a smooth
17 transition from colors to neutral within the K-only neutral image.

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19 **10. (Cancelled)**
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11. (Original) The method of claim 9, wherein the mapping includes:
reducing color within a region adjacent to a neutral axis of a process-neutral color space by mapping the process-neutral color space into an Lab color space and moving a point within the Lab color space according to vectors connecting the point within the Lab color space, a point on a neutral axis in the Lab color space, a point on a boundary of the Lab color space and a point having neutral hue.

12. (Original) The method of claim 9, wherein the mapping includes:
mapping colors into a color space defined in Lab; and
mapping each point within the color space defined in Lab, wherein points along a process-neutral axis are mapped to more neutral colors.

13. (Original) The method of claim 12, wherein mapping each point includes:

establishing a first vector between a point on a neutral axis and a point having neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the color space;

establishing a third vector through the point having neutral hue and the point on the boundary of the color space;

establishing a fourth vector bisecting the second and the third vectors;

projecting the point to be moved onto the fourth vector; and

using formulas based on lengths of the vectors to move the point to be moved to a new location having a similar L value.

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2 **14. (Original)** The method of claim 13, wherein using formulas
3 includes:

4 applying a first formula wherein a point to be moved is within a circle
5 enclosing the first vector; and

6 applying a second formula wherein the point to be moved is not within the
7 circle enclosing the first vector.
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15. (Currently Amended) A color mapping apparatus, comprising:

a BG module to generate BG coefficients for process-neutral and K-only images, and to adjust a degree to which the generation of BG coefficients is similar for the process-neutral and the K-only images;

a UCR module to generate UCR coefficients for process-neutral and K-only images, and to adjust a degree to which the generation of UCR coefficients is similar for the process-neutral and the K-only images; and

a mapping module to map CMK color data to CMYK color data using the generated BG coefficients and the generated UCR coefficients; coefficients; and
a neutral axis correction module to reduce color from a neutral axis of a process-neutral color space by moving points in the process-neutral color space to make the neutral axis less colorful, wherein the neutral axis correction module comprises configurations for:

mapping the process-neutral color space into Lab color space;

establishing a first vector between a point on the neutral axis and a point having neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the gamut;

establishing a third vector through the point having neutral hue and the point on the boundary of the gamut;

establishing a fourth vector bisecting the second and third vectors;

projecting the point to be moved onto the fourth; and

using formulas based on the vectors to move the point to be moved to a new location having similar L value with less color.

1 **16. (Original)** The color mapping apparatus of claim 15, where
2 in the BG module comprises configurations for:
3 using similar BG coefficients to map a color in both process-neutral and K-
4 only mapping, wherein the color is greater than a distance from a neutral line;
5 using dissimilar BG coefficients to map a color in both process-neutral and
6 K-only mapping, wherein the color is less than the distance from the neutral line;
7 and
8 controlling the distance to achieve a desired degree of harmony between the
9 process-neutral and K-only images.
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11 **17. (Original)** The color mapping apparatus of claim 15, where in the
12 UCR module comprises configurations for:
13 using similar UCR coefficients to map a color in both process-neutral and
14 K-only mapping, wherein the color is greater than a distance from a neutral line;
15 using dissimilar UCR coefficients to map a color in both process-neutral
16 and K-only mapping, wherein the color is less than the distance from the neutral
17 line; and
18 controlling the distance to achieve a desired degree of harmony between the
19 process-neutral and K-only images.
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21 **18—19. (Cancelled)**
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1 **20. (Currently Amended)** The color mapping apparatus of ~~claim~~
2 ~~19~~claim 15, wherein the neutral axis correction module additionally comprises
3 configurations for:

4 mapping values of a and b by adding $(dps/(db - \text{constant} * vml)) * vm(1)$
5 and $(dps/(db - \text{constant} * vml)) * vm(2)$ respectively; and

6 mapping values of a and b by adding them to the vector vm where the point
7 to be moved is within a circle enclosing the correction vector.

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9 **21—26. (Cancelled)**
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11 **27. (Currently Amended)** A processor-readable medium comprising
12 processor-executable instructions for controlling a degree to which a process-
13 neutral image and a K-only neutral image are harmonized, the processor-
14 executable instructions comprising instructions for:

15 generating similar BG values for colors within the process-neutral image
16 and the K-only neutral image beyond a distance from a neutral axis;

17 generating dissimilar BG values for colors within the process-neutral image
18 and the K-only neutral image within the distance from the neutral axis; and

19 mapping CMY color data to CMYK color data using the generated BG
20 ~~coefficients~~; coefficients; and

21 adjusting the distance to balance color similarity between the process-
22 neutral image and the K-only neutral image against a smooth transition to the
23 neutral axis in colors within the K-only neutral image.
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1 **28. (Cancelled)**

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3 **29. (Original)** The processor-readable medium as recited in claim 27,
4 wherein the mapping includes instructions for:

5 reducing color within a region adjacent to the neutral axis by moving most
6 or all points in a process-neutral color space within which the process-neutral axis
7 is defined.

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9 **30. (Original)** The processor-readable medium as recited in claim 27,
10 wherein the mapping includes instructions for:

11 reducing color within a region adjacent to the neutral axis within a process-
12 neutral color space by mapping process-neutral colors into an Lab color space and
13 moving a point within the Lab color space according to vectors connecting the
14 point within the Lab color space, a point on the neutral axis, a point on a gamut
15 boundary and a point having neutral hue.

1 **31. (New)** A method of controlling a degree to which a process-neutral
2 image and a K-only neutral image are harmonized, comprising:

3 generating similar BG values for colors within the process-neutral image
4 and the K-only neutral image beyond a first distance from a first neutral axis;

5 generating dissimilar BG values for colors within the process-neutral image
6 and the K-only neutral image within the first distance from the first neutral axis;

7 generating similar UCR values for colors within the process-neutral image
8 and the K-only neutral image beyond a second distance from a second neutral
9 axis;

10 generating dissimilar UCR values for colors within the process-neutral
11 image and the K-only neutral image within the second distance from the second
12 neutral axis; and

13 mapping CMY color data to CMYK color data using the generated BG
14 coefficients and the generated UCR coefficients, wherein the mapping includes
15 reducing color within a region adjacent to a neutral axis of a process-neutral color
16 space by mapping the process-neutral color space into an Lab color space and
17 moving a point within the Lab color space according to vectors connecting the
18 point within the Lab color space, a point on a neutral axis in the Lab color space, a
19 point on a boundary of the Lab color space and a point having neutral hue.

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1 **32. (New)** A processor-readable medium comprising processor-
2 executable instructions for controlling a degree to which a process-neutral image
3 and a K-only neutral image are harmonized, the processor-executable instructions
4 comprising instructions for:

5 generating similar BG values for colors within the process-neutral image
6 and the K-only neutral image beyond a distance from a neutral axis;

7 generating dissimilar BG values for colors within the process-neutral image
8 and the K-only neutral image within the distance from the neutral axis; and

9 mapping CMY color data to CMYK color data using the generated BG
10 coefficients, wherein the mapping includes instructions for:

11 reducing color within a region adjacent to the neutral axis within a
12 process-neutral color space by mapping process-neutral colors into an Lab color
13 space and moving a point within the Lab color space according to vectors
14 connecting the point within the Lab color space, a point on the neutral axis, a point
15 on a gamut boundary and a point having neutral hue.

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17 **33. (New)** A method of controlling a degree to which a process-neutral
18 image and a K-only neutral image are harmonized, comprising:

19 generating similar BG values for colors within the process-neutral image
20 and the K-only neutral image beyond a first distance from a first neutral axis;

21 generating dissimilar BG values for colors within the process-neutral image
22 and the K-only neutral image within the first distance from the first neutral axis;
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generating similar UCR values for colors within the process-neutral image and the K-only neutral image beyond a second distance from a second neutral axis;

generating dissimilar UCR values for colors within the process-neutral image and the K-only neutral image within the second distance from the second neutral axis; and

mapping CMY color data to CMYK color data using the generated BG coefficients and the generated UCR coefficients, wherein the mapping includes:

mapping colors into a color space defined in Lab; and

mapping each point within the color space defined in Lab, wherein points along a process-neutral axis are mapped to more neutral colors, wherein mapping each point includes:

establishing a first vector between a point on a neutral axis and a point having neutral hue;

establishing a second vector through the point on the neutral axis and a point to be moved and a point on a boundary of the color space;

establishing a third vector through the point having neutral hue and the point on the boundary of the color space;

establishing a fourth vector bisecting the second and the third vectors;

projecting the point to be moved onto the fourth vector; and

using formulas based on lengths of the vectors to move the point to be moved to a new location having a similar L value.